Remarks/Arguments:

Applicant wishes to thank the Examiner for his detailed comments. As Examiner has grouped his actions by sections, Applicant will respond to these sections one by one.

DETAILED ACTION

Election/Restrictions

1-2. No reply is believed to be necessary.

Oath/Declaration

3. Examiner has stated:

"The oath or declaration is defective…."

A new Declaration is attached.

Claim Rejections -35 USC § 112

4-5. Examiner has stated:

"The following is a quotation of the second paragraph of 35 U.S.C. 112…"

"Claims I through 10 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject mailer which applicant regards as the invention.

"In Claim 1, the phrases of "the P1" (line 2) and "the P3" (line 3), each lack positive antecedent basis.

"In Claim 8, the phrase of "said PS layer" (line 2) lacks positive antecedent basis. Furthermore, what previous layer is "said PS layer" referring to? The examiner presumes this recitation is referring to the "sacrificial layer" (line 5 of Claim 1)."

It is thought that the current amendments to Claims 1, 6 and 8 have corrected these problems. It is respectfully urged that the rejections of these claims be withdrawn.

Claim Rejections - 35 USC § 103

6-7. Examiner has stated:

"The following is a quotation of 35 U.S.C. 103(a)..."

"Claims 1,2 and 4 through 9, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al 6,278,591 in view of Cohen et al 5,141,623.

"Chang discloses a method of making a write pole top for a magnetic head comprising: fabricating **P1 (e.g. 302)**," (emphasis added- L.G.) "coils (e.g. 366, 372) and a **P2 flux shaping layer (e.g. 312)**; " (emphasis added- L.G.) "depositing a **P3 layer (e.g. 342)** "(emphasis added- L.G.) "on the P2 flux shaping layer by plating; shaping the P3 layer into a P3 pole tip (at the ABS in Fig. 63); and encapsulating the P3 pole top layer in an encapsulating material (e.g.380).

Applicant respectfully asserts that there are a number of misconceptions and errors in the Examiner's statements. First of all, the invention claimed in Claim 1 of the present invention is a write pole tip for **perpendicular recording**, as is apparent throughout the text of the present specification and the preamble of Claim 1. *Chang* is a longitudinal recording head and thus is not concerned with perpendicular recording**.** The structure of a perpendicular recording head is quite different in design and application from the earlier longitudinal recording head. As referred to in the specification:

"More recently, perpendicular magnetic recording systems have been developed for use in computer hard disk drives. A typical perpendicular recording head includes a trailing write pole, a leading return or opposing pole magnetically coupled to the write pole, and an electrically conductive magnetizing coil surrounding the write pole. In this type of disk drive, the magnetic field of bits of stored information are oriented normally to the plane of the thin film of media, and thus perpendicular to the direction of a circular data track, hence the name." (Specification page 1, lines 15-21)

Also, from the present specification:

"...current will cause magnetic flux **2** to flow through the P2 shaping layer **44** through the P3 layer **50** to the narrow pole tip **54** into the hard layer **24** and soft layer **28** of the hard disk **24**. This magnetic flux **2** causes magnetized data bits to be recorded in the high coercivity layer hard layer **24** where the magnetic field of the data bits is perpendicular to the surface of the disk **24**. The magnetic flux then flows into the magnetically soft underlayer **28** and disperse as they loop back towards the P1 pole **34**. The magnetic flux then flows through the back gap piece **46** to the P2 shaping layer **44**, thus completing a magnetic flux circuit. In such perpendicular write heads, it is significant that at the ABS **22**, the P1 pole **34** is much larger than the P3 pole tip **52** so

that the density of the magnetic flux passing out from the high coercivity magnetic hard layer **26** is greatly reduced as it returns to the P1 pole layer **34** and will not magnetically affect, or flip, the magnetic field of data bits on the hard disk, such as bits on data tracks adjacent to the track being written upon." (Specification page 7, lines 8-20)

Although the structures of longitudinal and the perpendicular recording heads are different, they do have the common feature that there is a P1 pole and a P2 pole with the coils positioned between them. In each case, the P1 pole and the P2 pole are connected at a back gap. In longitudinal write heads, magnetic flux passes between the P1 pole through the recording media to the P2 pole to complete a magnetic circuit. In the *Chang* reference, the P1 pole has been split into a bottom first pole tip **312** (P1B/S2) and a top first pole tip **318** (P1T). A write gap layer **334** is formed on the P1T layer **318**, and the P2 pole **342** is then formed on the gap layer **334**. There is no teaching or suggestion of a P3 layer in *Chang*, as would be expected from a longitudinal recording head, which doesn't use one.

Thus the P3 pole as used generally in perpendicular write heads and specifically in the present invention, is a much different structure, with different concerns and design problems, than the longitudinal write head of *Chang*, and also of *Cohen*, both of which do not include a P3 pole at all. The bottom first pole tip **312** (P1B/S2), top first pole tip **318** (P1T) and P2 poles **342** of *Chang* do not correspond to the P1 **34**, P2 flux shaping layer **44** and P3 **54** poles of the present invention.

Thus, in the Examiner's statement above, there are several mistatements:

"Chang discloses a method of making a write pole top for a magnetic head comprising: fabricating **P1 (e.g. 302)**," (emphasis added- L.G.) "coils (e.g. 366, 372) and a **P2 flux shaping layer (e.g. 312)**; depositing a **P3 layer (e.g. 342)…"**

Element **302** is actually the "first shield layer **302**" (*Chang* col. 14, line 58), element **312** is actually the "bottom first pole tip **312**" (*Chang* col. 14, line 65) and element **342** is actually the "second pole tip layer **342"** (*Chang* col. 15 line 19).

There is no teaching or suggestion that a P3 layer exists or has been contemplated.

In the discussion of the method of making in *Chang*, various stages are illustrated in Figs. 24-64. However, it is not until we get to Fig. 56 that the second pole tip (P2) **342** is shown to be formed on a write gap layer **334,** which is in turn formed on P1T **318** (*Chang* col. 18, starting line 62). Thus, if *Chang* had been concerned with the fabrication of a perpendicular write head rather than a longitudinal write head, by analogy, the stage shown in *Chang* Fig. 56 might roughly coincide in the process with stage A) of Claim 1 of the present application, which, as amended, recites:

> "A) fabricating a P1 pole, coils and a P2 flux shaping layer;"

However, even this rough analogy is inaccurate, as the P2 flux shaping layer is not the same structure as the P2 pole tip **342** of *Chang*. Its purpose is to shape and direct the magnetic flux into the P3 layer, for which there is no corresponding structure in *Chang*. In a perpendicular write head, such as the present invention, the flux then flows through P3 pole to the P1 pole to write the data in a perpendicular manner, as shown in Fig. 1 of the present application.

Therefore, there are no corresponding stages in the cited reference for any of the following stages in Claim 1 of the present application:

> "B) depositing a P3 layer on said P2 flux shaping layer;
> C) depositing a CMP stop layer on said P3 layer;
> D) depositing at least one sacrificial layer on said CMP stop layer;
> E) shaping said P3 layer into P3 pole tip;
> F) removing said at least one sacrificial layer to leave said P3 pole tip; and
> G) encapsulating said P3 pole tip in a protective layer."

An examination of the Figs. 57-64, which complete the method of making in *Chang* and the accompanying text do not teach a P3 layer, a CMP layer on P3, or a sacrificial layer on the CMP stop layer. The only reference Applicant can find

relating to a sacrificial layer is a discussion of a sacrificial layer **426** on the first top pole tip **318** (*Chang* col. 17, line 46). However, this is a completely different structure and method from the method of the present invention. It cannot be fairly said that the *Chang* reference has the necessary elements alone or in combination to support a rejection on the basis of obviousness.

Examiner has further stated:

"Chang does not teach that the P3 layer is patterned by depositing a CMP stop layer on the P3 layer, depositing at least one sacrificial layer on the CMP stop layer, and removing the at least one sacrificial layer to leave the P3 pole tip.

"Cohen discloses a pole patterning process that includes depositing a **CMP stop layer (e.g. 29, 30) on a P3 layer (e.g. 24 in Fig. 3J), depositing at least one sacrificial layer (e.g. 32) on the CMP stop layer, and removing the at least one sacrificial layer to leave the P3 pole tip (see sequence of Figs. 3G to 3J)**.)," (emphasis added- L.G.)

Cohen, as with *Chang,* is a longitudinal recording head and thus is not concerned with perpendicular recording, which Applicant believes was unknown in 1990 at the time of filing**.** As discussed above, the structure of a perpendicular recording head is quite different in design and application from the earlier longitudinal recording head. Further, in the *Cohen* reference, element **29** is actually photoresist dams **29** and element **30** is a sacrificial mask layer **30**. Element **24** in Fig. 3J is recited as the "upper pole tip **24"** (*Cohen*, col. 5, line 27) with no reference to a P3 layer, as is used in a perpendicular write head. Element **32** is in fact recited as a sacrificial mask layer **32**, but there is no teaching that it is used on a CMP stop layer.

This is obviously a completely different structure and method from the method of the present invention. It cannot be fairly said that the *Cohen* reference has the necessary elements alone or in combination to support a rejection on the basis of obviousness.

Thus Applicant respectfully requests that the rejection be withdrawn, and Claim 1 of the present application be allowed.

Examiner has further stated:

"Regarding Claim(s) 2, Cohen further teaches within the process that the P3 layer material is NiFe (col. 5, lines 30-31).

"Regarding Claim(s) 4 through 6, Cohen further teaches that the sacrificial layer is NiFe (col. *5,* lines 60-65) and also includes a seed layer (e.g. 27). The sacrificial layer is created by forming a cavity surrounded by photo-resist material (e.g. 29) where the sacrificial material fills or is deposited in the cavity.

"Regarding Claim(s) 7 through 9, Cohen further teaches shaping of the P3 layer is done by ion milling where the sacrificial layer is a mask and the CMP stop layer is a secondary mask. The ion milling is used to bevel sides of the P3 pole tip and is beveled at an angle of **150** (see Figs. 3F to 3J, and the Tilt angle at Table in col. 6).

"The benefits of the overall pole patterning process of Cohen allows better pole alignment between P3, P2 and P1 with increased data storage densities (col. 3, lines 3-5) and provides a CMP stop layer and sacrificial layer that is more controllable and readily removable (col. 2, lines 66-68).

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Chang by utilizing the pole patterning process of Cohen, to provide the benefits of better pole alignment with increased data storage densities and a patterning technique that is more controllable and readily removable."

Claims 2, 4-6, and 7-9, are dependent upon independent Claim 1, and inherit by their dependence the assertedly allowable subject matter of Claim 1.

Therefore, Applicant respectfully requests that the rejections as to these claims be withdrawn and Claims 2, 4-6, and 7-9 be allowed.

8. Examiner has further stated:

"Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al in view of Cohen et al, as applied to Claim 1 above, and further in view of Tran et al *5,853,960.*

"Chang, as modified by Cohen, discloses a manufacturing method as relied upon above. The modified Chang method does not teach that the CMP stop layer is made of $A1_2 0_3$, i.e. aluminum oxide, and that the CMP stop layer matches the material of the encapsulating material.

"It is noted that the encapsulating material of Chang is an insulating material (see Chang col. 18, lines 42-44) and one of the materials of the CMP stop layer material of Cohen is a photoresist.

"Tran shows that it is known to utilize aluminum oxide as a photoresist material (col. 7,

lines 6-14) and that aluminum oxide is a well known and conventional insulating material.

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Chang by utilizing aluminum oxide (Al_2O_3) as the material for both the CMP stop layer and the encapsulating material to provide the necessary patterning material in the shaping of the P3 layer and to insulate the P3 layer."

Claims 3 and 13, are dependent upon independent Claim 1, and inherit by their dependence the assertedly allowable subject matter of Claim 1.

Therefore, Applicant respectfully requests that the objections as to these claims be withdrawn and these claims be allowed.

9. "Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentabie over Chang et ai in view of Cohen et al, as applied to Claim 1 above, and further in view of Qhtsu et al 20040052009.

"Chang, as modified by Cohen, discloses a manufacturing method as relied upon above. The modified Chang method does not teach that the P3 pole tip has a width less than 200 nm. Ohtsu teaches forming P3 (e.g. 31 or 33) to a trackwidth less than 200nm (paragraphs [0049]), which would thus form the width of P3 less than 200 nm. The benefit of Ohtsu having this width allows improvements in asymmetry and in the utility factor (see paragraph [0048] and [0050]).

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Chang by forming the P3 pole tip to a width less than 200 nm, as taught by Ohtsu, to provide improvements in the asymmetry and the utility factor."

Claim 10 is dependent upon independent Claim 1, and inherits by its dependence the assertedly allowable subject matter of Claim 1.

Therefore, Applicant respectfully requests that the rejections as to this claim be withdrawn and this claim be allowed.

Thus Applicant respectfully asserts that remaining Claims 1-10, and 13 are allowable over the cited prior art and requests that the rejections as to Claims 1-10, and 13 be withdrawn and these claims be allowed.

Further, as Claim 1 is assertedly an allowable generic or linking claim, it is requested that Claims 11, 12 and 14 be re-entered and allowed so that all Claims 1-14 be allowed.

Conclusion:

Applicant has endeavored to put this case into complete condition for allowance. It is thought that the §112 rejections have been corrected by amendment and that the §103 rejections have been unfounded on the cited references. Applicant therefore respectfully asks that the rejections be withdrawn and that allowance of all claims presently in the case now be granted.

If the Examiner would like to discuss any of the points involved in the Response, he is urged to contact Applicant's Attorney at the numbers included below.

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